Title: Planting Patterns and Fun with Functions!

Brief Overview:

Patterns are everywhere. Patterns are found on clothing, in the grocery store, in music and throughout mathematics. In this Concept Development Unit students, through hands-on activities and problem solving, will explore and identify patterns in a variety of ways; compute functions that communicate the relationship between pairs of numbers; apply the pattern and function to extend the relationship; and finally display the relationship in a graphic format. By the end of the unit, students will be able to look at a function table, visualize the pattern, verbalize the rule for the table, and plot it accurately on a graph.

NCTM Content Standard/National Science Education Standard:

Algebra
Understand patterns, relations and functions:
Describe, extend and make generalizations about geometric and numeric patterns;
Represent and analyze patterns and functions, using words, tables and graphs**.**

Analyze change in various contents
Investigate how change in one variable relates to a change in a second variable.
Identify and describe situations with constant or varying rates of change and compare them.

Grade/Level:

This unit addresses content suited for fourth grade GT and fifth grade students.

Duration/Length:

This unit is designed for three one hour periods.

Student Outcomes:

Students will:

- Explore patterns with classmates in a variety of ways.
- Determine a rule given sets of numbers that have a relationship (describing the change in the "Y" values in a function table).
- Extend, describe and explore patterns.
- Formulate a rule for a set of numbers [having determined the functional relationship] (finding the constant expression that changes each "X" value to a "Y" value in a function table).
- Plot coordinate points from the function table accurately on a graph and connect the points to show a slope.

Materials and Resources:

- Literature Resources –
- <u>Two of Everything</u> by Lily Toy Hong
- <u>One Grain Of Rice: A Mathematical Folktale</u> by Demi
- <u>The King's Chessboard</u> by David Birch

  Day 1

  Toothpicks
  Triangular solids
  Triangle stickers
  Markers
  Chart paper
  Overhead projector / Elmo
  Student Resource 1A-B
  Teacher Resource 1A-B
  Student Resource 2
  Teacher Resource 2
  Student Resource 3
  Teacher Resource 3
  Student Resource 4
  Teacher Resource 4
  Student Resource 5
  Teacher Resource 5

  Day 2

  Function Table – On the Farm pre-assessment
  Markers
  Chart paper
  Student Resource 6
  Teacher Resource 6
  Student Resource 7A-B
  Teacher Resource 7A-B
  Student Resource 8A-B
  Teacher Resource 8A-B

  Day 3

  Colored pencils
  Rulers
  Student Resource 9
  Teacher Resource 9

Student Resource 10
Teacher Resource 10
Student Resource 11A-B
Teacher Resource 11A-B
Student Resource 12
Teacher Resource 12

Development/Procedures:

Day 1

o **Pre-Assessment**
  • The students should have an introductory understanding of patterns and functions and should be able to identify simple geometric patterns or everyday patterns. These skills should have been introduced in fourth grade. A review and extension of each skill are incorporated into the lesson.
  • Divide students into groups of three and distribute On the Farm, Student Resource 1A-B, and toothpicks to each small group. Have each student take out a pencil. On the Farm, Teacher Resource 1A-B: Teacher Answer Key provides the answers.
  • Tell students to read the story about Farmer Smith with their partner/s and then use their toothpicks to create the diagram of the plots. The purpose of the pre-assessment is to note the background knowledge a student has on the topic/s that will be presented in this unit.

o **Engagement**
  • Once students begin, observe different groups to assess how successful they are at extending patterns and determining the rules.
  • Provide quiet direction to students that are struggling by asking them what patterns they may see. Say: Look at plot one. How many toothpicks do you need to add to create another plot?
  • By observing the students you will be able to see who needs extra support.

o **Exploration**
  • Have students stop after ten minutes of the pre-assessment.
  • Distribute triangular solids, triangle stickers, markers, chart paper and Fun with Triangles, Student Resource 2.
  • Ask students to look at Fun with Triangles, Student Resource 2 to guide them in building the diagram from the resource sheet onto the chart paper using the sticker triangles. Tell the students that even though the pattern on their paper stops after 3 large triangles ask them to try and extend their patterns to five large triangles on their chart paper.
  • Once they have created the five large triangles tell the students to stop.
  • For groups that are struggling, prompt their thinking by asking questions such as: How many triangles were added to the first triangle to make the second triangle?

The second to the third? Do you see a pattern? How many triangles do you think you need to add to the third triangle to make the fourth large triangle? See Teacher Resource 2 for the answer key.

- o **Explanation**
  - After about 10 minutes of exploration ask students to share how they created triangle 4. How many triangles did you add to triangle 3 to create triangle 4? Can someone demonstrate what they did on the overhead/Elmo?
  - Have a student model triangle 4 on the overhead/Elmo using the triangles.
  - Continue to lead a discussion in which students verbalize how their groups extended the pattern to create triangle 5.

- o **Application**
  - Explain to the students that you want them to continue their triangle patterns through triangle 7.
  - Model for the students. Place one triangle on the overhead to represent Triangle #1. Place four triangles on the overhead to represent Triangle #2. Place nine triangles on the overhead to represent Triangle #3. Place sixteen triangles on the overhead to represent Triangle #4. Place twenty five triangles on the overhead to represent Triangle #5.
  - Have the students use their triangle stickers to continue extending the diagram through triangle 7 on chart paper as well as fill in the rule on Fun with Triangles, Resource 3. Have the students use markers to label their work, Triangle 1, Triangle 2, Triangle 3, Triangle 4, Triangle 5, Triangle 6 and Triangle 7.

- o **Differentiation**
  - Reteach
    For the students who have not completely understood the lesson, have them complete On the Farm (Part 2), Student Resource 4. This sheet uses the same Farmer Smith exercise from the pre-assessment but provides the students with more clues to find the pattern. Provide direct small group instruction to assist students. On the Farm (Part 2), Teacher Resource 4, Teacher Answer Key provides the teacher with the answers.
  - Enrich
    For the students that understood the lesson, take them to the next level with Fun with Patterns and Rules, Student Resource 3 in which students extend patterns and identify the rules. Fun with Patterns and Rules, Teacher Resource 3 Teacher Answer Key provides you with the answers.

- o **Assessment**
  - Distribute Student Resource 5, Working Out with Patterns. Teacher Resource 5, Teacher Answer Key provides the teacher with answers.
  - Have the students complete this exit card. Review the exit card after class and with the students at the beginning of the next class to clarify any misconceptions the students still have.

Day 2   What is a function?

- o **Engagement**
  - Distribute Student Resource 6, warm-up to the students. Give the students 5 minutes to complete the review of patterns from the day before.
  - Review Student Resource 6, Answer Key: Teacher Resource 6, with the students and ask them to put it off to the side.
  - Ask students: What is a function? What is a variable? What is a rule? What is an expression?
  - Select a few students to share their thinking.
  - o Post the definition of function. Say to the students that it is the relationship between two quantities in which one quantity depends on the other.
  - Post the definition of variable. Say to the students that a variable is a letter or symbol that stands for one or more numbers. For example, x, y, w, or any other letter of the alphabet.
  - Post the definition of expression. Say to the students that an expression is a mathematical phrase that combines numbers, operation signs, and sometimes variables, but doesn't have an equal sign. For example, $4 + n$.
  - Post the definition of rule. Say to the students a rule is an algebraic or numerical sentence that shows that two quantities are equal. For example, $12 + n = 13$, $n = 1$.

- o **Exploration**
  - Display the function table from the pre-assessment **On the Farm**. Say: if I look on the chart, I see that for every new plot we add, we add three more pieces of fence. Say to the students: the only time Farmer Smith uses four pieces of fence is for the first plot. Each time he adds a new plot it shares a side with the fence next to it. We will always begin with 4 but add three each time we add a new fence.
  - Put the number 10 under the number of plots (input) and continue to model how to find the output by using the think aloud strategy.
  - Say to students: what rule represents the relationship between the number of plots built, which is the input and the number of pieces of fence, which is the output? (input, x, output, y). What rule can we write to help us apply the rule? $(3x + 1) = y$.

- o **Explanation**
  - Say to students: using the rule we just created, solve the following problem. If Farmer Smith wanted to build fences around 25 plots, how many pieces of fence would he need? (76)
  - Choose two or three students to explain how they arrived at the answer.

- o **Application**
  - Divide the class into groups of four and distribute What's the Function?, Student Resource 7A-B, a marker and a piece of chart paper. Student Resource 7A-B, What's the Function?, consists of different function tables,

and rules that need to be changed into expressions. Teacher Resource 7A-B provides you with the answers.

- Assign each group a problem on the resource sheet along with a piece of chart paper and a marker. Tell the students to recreate the function table on their chart paper. Let them know they will be presenting their completed function table, and rule to the class.
- Allow each group 10 minutes to complete the function table and write a rule for finding the output.
- As the groups are working circulate around the room and help the groups as needed.
- Have each group share their function tables and explain their thinking to the class.
- Make sure to clarify any misconceptions the students may have.
- Display student work around the room.

o **Differentiation**

Reteach - Students who have not completely understood the lesson will complete a different function table from Student Resource 7A-B with your guidance. In a small group provide more clues to help them determine the rule for a given function table.

Enrich - Students that understood the lesson will advance to the next level with Working out with Functions, Student Resource 8A-B in which students complete function tables and identify a rule for the output. Teacher Resource 8A-B provides you with the answers.

o **Assessment**

- Circulate throughout the classroom to observe students' understanding of completing a function table and generating a rule while in small groups.

Day 3

o **Exploration**

- Introduce the concept of how a set of numbers relate to each other in ways so that one can predict how one set will change in a uniform way as the other number changes. The topic of a farm (from days one and two) will be used to engage students.
- Review with students how patterns and functions relate to sets of numbers. Re-teach the concepts to insure understanding.
- Distribute the Graphs TALK Student Resource 9 and ask students to place the words and symbols in the box correctly around the graph. (Notice that a coordinate pair of numbers are given and a point is on the graph with a label for the coordinate pair found in the word box. Further notice that this point and coordinate pair are the third set of numbers in the function table that accompanies the graph on this practice sheet.)

- o **Explanation**
    - Explain to students that another way of showing the information found in a function table is to display it in graphic form. Display the Graphs TALK Teacher Resource 9 on overhead or Elmo and discuss the components of a graph.
    - Explain that all line graphs "TALK"- that is they all have a Title, Axis, Labels, and a Key. Point to each characteristic of the line graph and emphasize its importance.
    - Ask students to share the first two values of the function table included on the lower left corner of the Graphs Talk Student Resource 9. Explain that the value in the first column will represent the "slide across the X axis" and the value in the second column will represent the "crawl up the Y axis". Demonstrate sliding across the bottom of the graph 5 spaces, then up 7 spaces to where each value intersects. Move through the next set of values having a student place the point for the pair of coordinates on the graph. Complete plotting the points for the rest of the values from the function table. Draw a line that connects all the points.
    - Check for understanding.

- o **Application**

    - Just Plotting Along Student Resource 10. Have students complete the formative assessment by graphing the slope of the three function tables on the graph using different colored pencils.
    - Review assessment in class with students. Re-teach if necessary to ensure competency.

- o **Differentiation**
    - Re-teach
        For students who struggle with this portion of the lesson direct them to a table or desk group to conduct small group scaffolding in order to find the X and Y columns. Write the coordinate pair and locate the coordinate point on the graph.

- o **Summative Assessment**
        Distribute Summative Assessment Student Resource 11A-B. Read through directions with students so that they understand all expectations. Answer key can be found on Teacher Resource 11A-B.
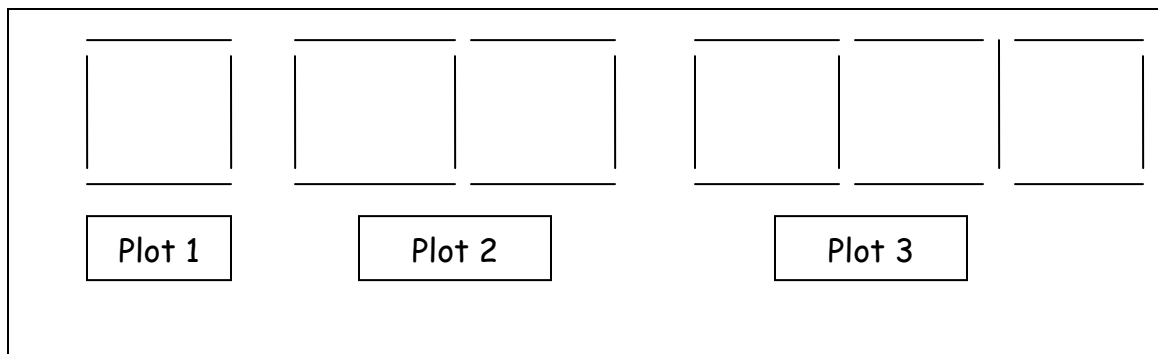

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On the Farm

Farmer Smith is the best farmer in Maryland, but he has encountered a problem on his rectangular crop farm. For each new crop Farmer Smith plants he needs to build a fence around the plot. The first plot Farmer Smith fences in uses 4 pieces of fence. Farmer Smith added a second plot to his crop farm and now has 7 pieces of fence around his rectangular crop garden. Take a look at Farmer Smith's crop farm and help him figure out how many pieces of fence he needs to go around 10 plots.

Use the toothpicks at you desks to create the following diagram. Complete the table to help you.

# of plots (x)	pieces of fence (y)
1	4
2	7
3	10
4	?
10	?

What is the rule for the pattern of pieces of fence (look at the "Y "column only) _____

What's the rule Hint: How do the numbers in the "X" column change into the numbers in the "Y" column? _____

Create a function to prove your rule.

_____

On the graph below, graph the function table.
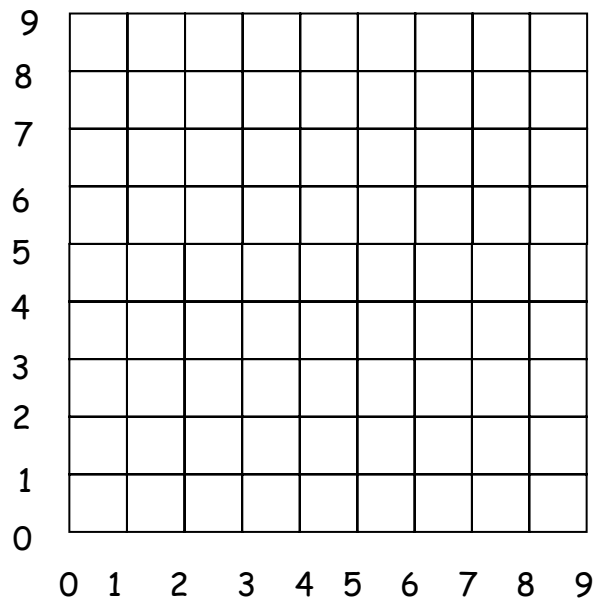
Fun with Triangles!

Directions: Below you see a pattern made up of triangles. Can you extend this pattern to make Triangle 4? Triangle 5? Use the triangles at your desk to create and extend the following pattern.
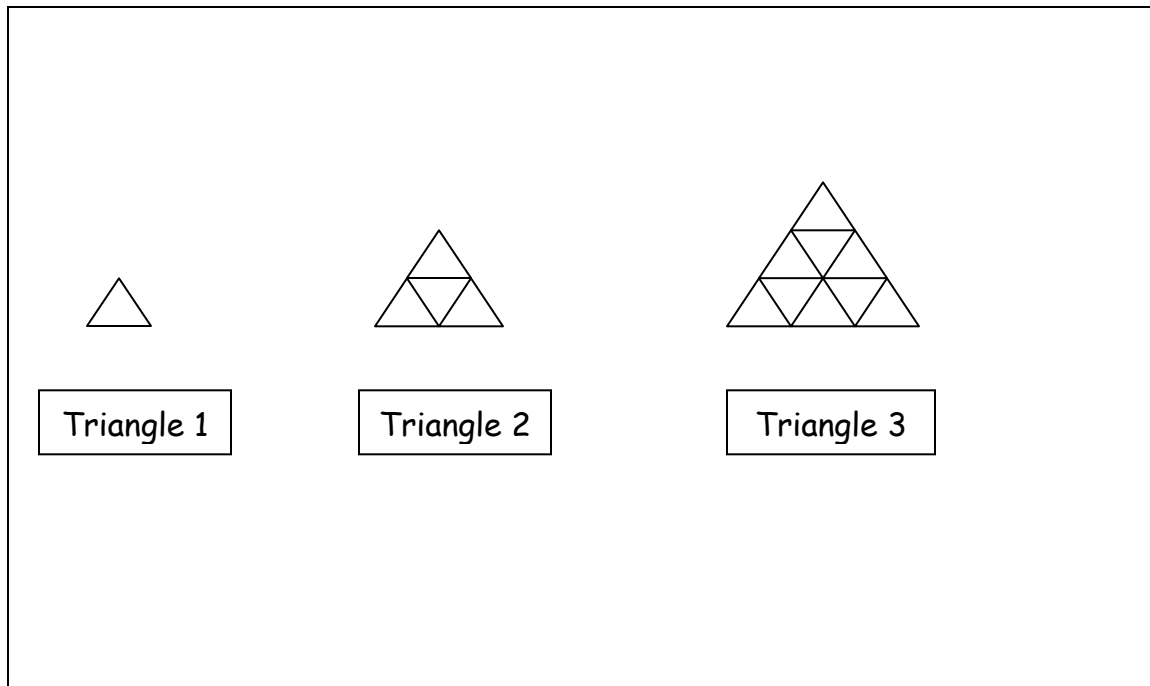
What pattern do you see in each additional triangle? How many more triangles does it take to build each new triangle?

The pattern I see is _____

Fun with Patterns and Rules!

Directions: Below you see function tables. Can you identify the rules? Give it a try!

1.

(x)	(y)
1	4
2	9
3	14
4	19
5	24
6	29
7	?

What's my Rule? _____

2.

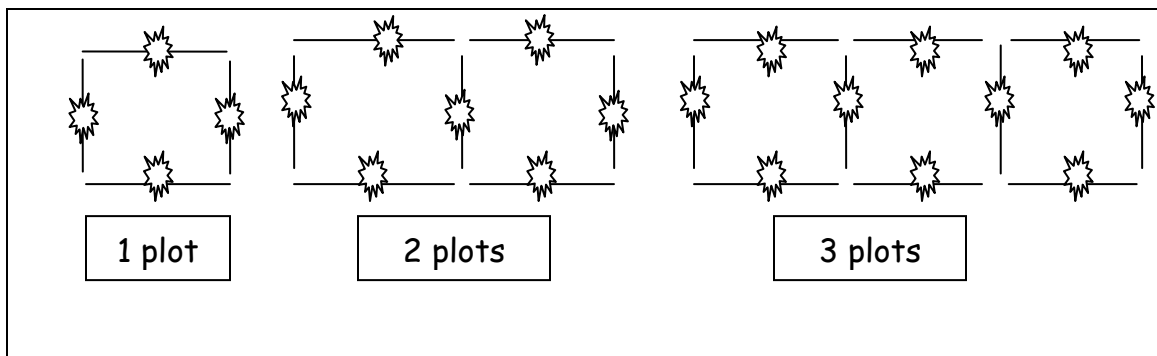| (x)	(y)
1	3
2	7
3	11
4	15
5	?
6	?
7	?

What's my Rule? _____

3.   3, 3, 6, 9, 15, ____, _____, _____, _____   Pattern: _____

4.   4, 16, 64, _____, _____, _____, _____   Pattern: _____

On the Farm (Part 2)

Farmer Smith is the best farmer in Maryland, but he has encountered a problem on his rectangular crop farm. For each new crop Farmer Smith plants he needs to build a fence around the plot. The first plot Farmer Smith fences in uses 4 pieces of fence. Farmer Smith added a second plot to his crop farm and now has 7 pieces of fence around his rectangular crop garden. Take a look at Farmer Smith's crop farm and help him figure out how many pieces of fence he needs to go around 5 plots.

Use the squares at you desks to create the following diagram. Use one square to create the first plot on your table. Use two squares to create the second plot and three squares to create the third plot. Use a highlighter to trace each side. **DO NOT TRACE A SIDE MORE THAN ONCE!** Use the squares and dry erase marker to help you. Once you have highlighted all of the sides as in the picture above, count the number of sides highlighted for each group of plots.

1 plot = _____ pieces of fence

2 plots = _____ pieces of fence

3 plots = _____ pieces of fence

5 plots = _____ pieces of fence

Working out with Patterns

Exit Card

Fill in the next three terms in the following sequences.
5, 9, 13, 17, _____, _____, _____

What's the pattern? _____

1, 4, 9, 16, 25, _____, _____, _____

What's the pattern? _____

Working out with Patterns

Exit Card

Fill in the next three terms in the following sequences.
5, 9, 13, 17, _____, _____, _____

What's the pattern? _____

1, 4, 9, 16, 25, _____, _____, _____

What's the pattern? _____

Day 2 - Warm-up

Complete the sequences below.

2, 5, 10, 17, _____, _____, _____

What's the pattern? _____
Predict the 10th term in this sequence. _____

2, 5, 8, 11, _____, _____, _____

What's the pattern? _____
Predict the 20th term in this sequence. _____

1, 3, 5, 7, _____, _____, _____

What's the pattern? _____
Predict the 12th term in this sequence. _____

2, 6, 10, 14, _____, _____, _____

What's the pattern?_____
Predict the 15th term in this sequence. _____

What's the Function?

Directions: Below you see function tables. Can you identify the rule and write it as an expression? Give it a try!

1

In	Out
1	5
2	10
3	15
4	?
5	?
n	

2

In	Out
1	5
2	8
3	11
4	?
5	?
n	

3

In	out
1	3
2	5
3	7
4	?
5	?
10	?
n	

4

In	out
1	9
2	19
3	29
4	?
5	?
10	?
n	

5

In	out
1	1
2	4
3	9
4	16
5	?
10	?
n	

6

In	out
1	3
2	6
3	9
4	?
5	?
10	?
n	

Working Out with Functions!

Directions: Below are patterns. For each pattern you see create a function table using two different variables and create a rule. The first one is done for you.

in	out
1	2
2	5
3	10
4	17
5	26
10	101
n	N squared + 1

In	out
6	12
3	6
4	8
8	?
?	18
12	?
n	

# of pine trees (r)	# of pine combs (s)
4	13
2	7
5	16
?	19
7	?
10	
n	

# of orange trees (b)	# of oranges (c)
8	17
3	7
4	9
9	?
?	15
11	?
n	

Graphs Just Won't Stop TALK – ing!

Directions: As a quick pre-assessment use the terms and labels from the word box to fill in the labels on the graph. Some items in the box you will not use. You may find a few new items in the word box. Can you place them accurately?

_____   _____

_____

_____
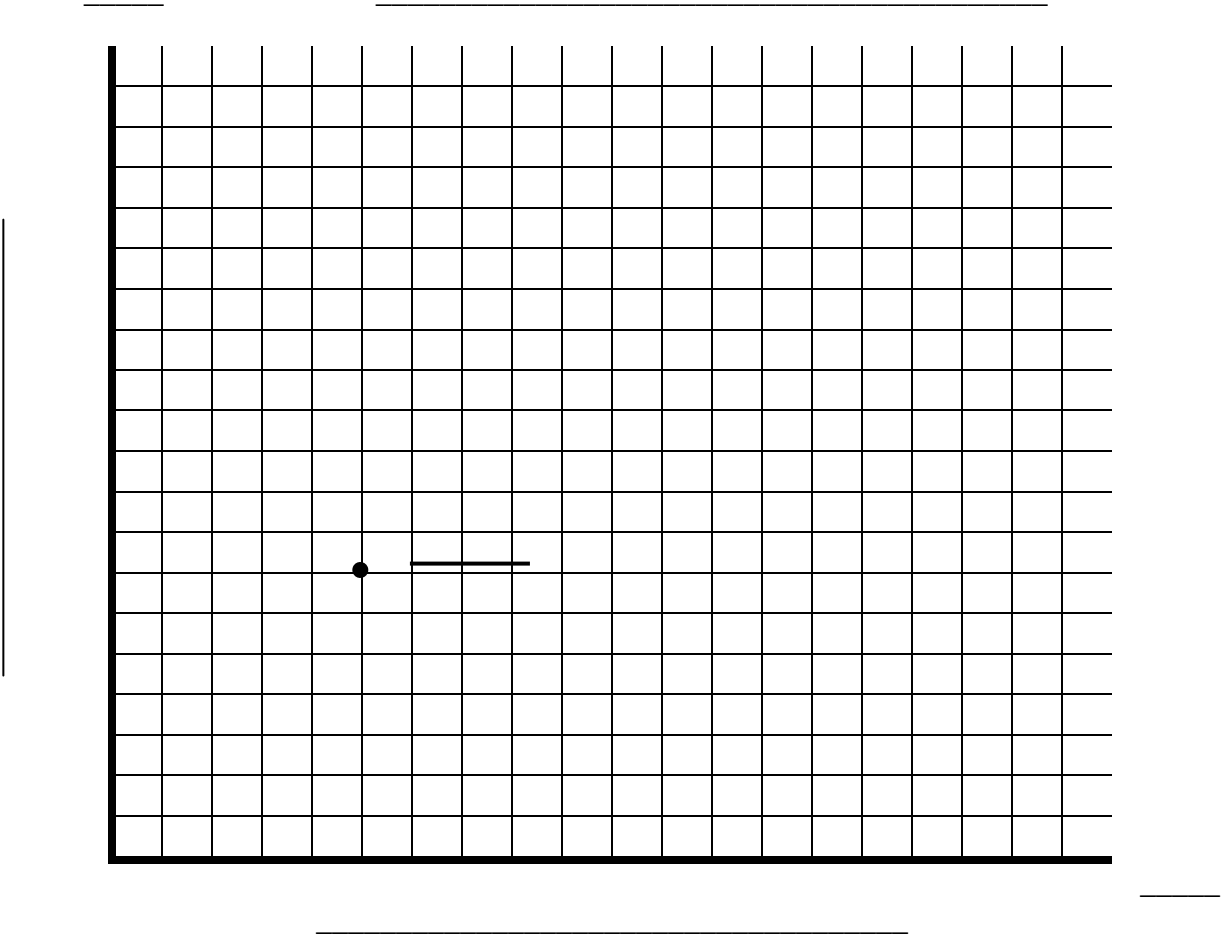
Word Box

2n-3	
2	1
3	3
5	7
8	13
11	19

Key   (5,7)   Divisor   X axis
Title   Label   Boundary
Graph   Y axis   Addend
Label

Just Potting Along
Creating a Slope From a Function

Directions: Using the function tables below: First, write the rule in the top table row. Next, write the missing function table values. Then correctly plot the coordinate points from the function table onto the accompanying graph. Use colored pencils: red for #1; blue for #2' yellow for #3.
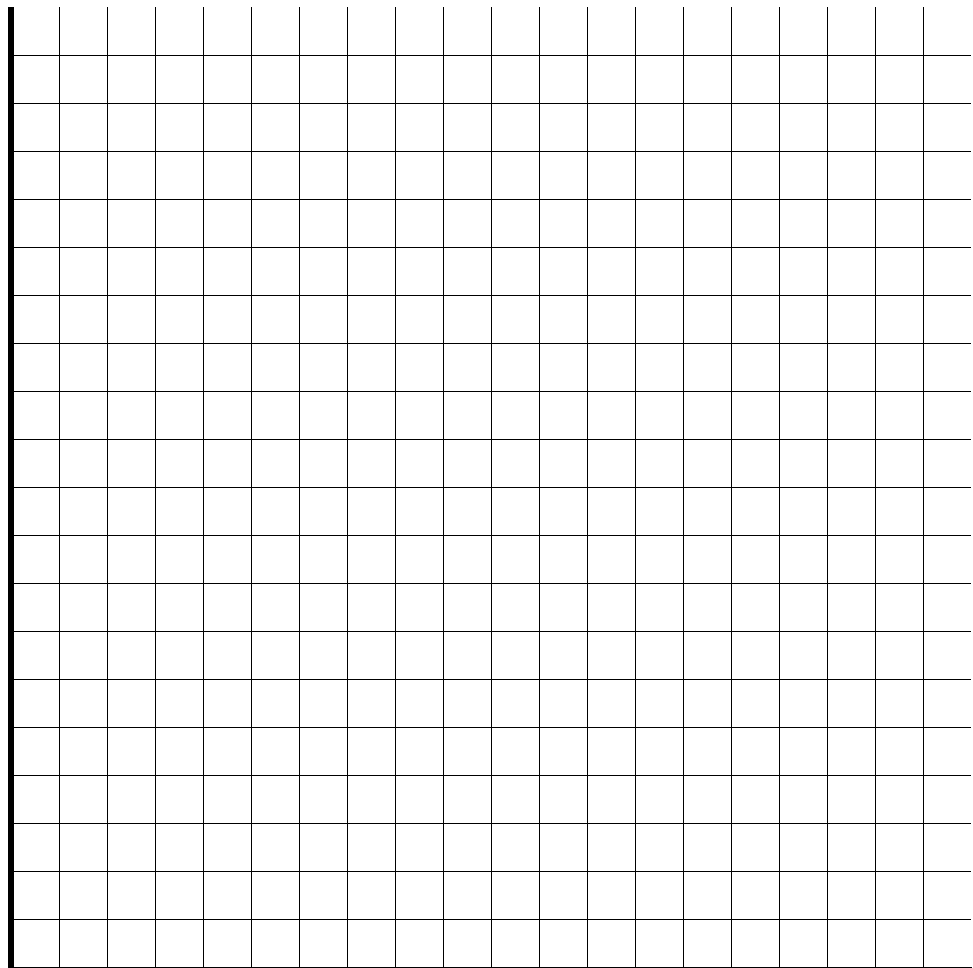
1

x	y
0	2
3	5
7	9
10	
13	

2

x	y
0	0
2	4
5	
7	14
9	

3

x	y
0	2
3	8
4	
5	12
7	

Putting Them All Together
Combining Patterns, Functions, and Slopes

Directions: Now that we have studied patterns, functions and slopes (graphing) you should be able to show your understanding of these math concepts. Read the following questions carefully and choose the best answer for the selected responses. For the written response remember to answer the question or prompt fully to show your understanding!

1. What are the next three values in the following pattern; 1, 3, 2, 4, 3, 5, 4, 6
    a. 7, 9, 11
    b. 5, 7, 9
    c. 5, 6, 8
    d. 5, 7, 6,

2. What do we call the expression that represents the relationship between two values?
    a. the pattern
    b. the rule
    c. the intersection
    d. the parallel

3. Choose the *rule* that fits the following function table:
    a. $n + 1$
    b. $n \times 7$
    c. $n + 7$
    d. $n = 35$

x	y
1	7
2	14
3	21
4	28
5	35
n	

4. Which rule satisfies the function table?

a. "X" + an odd number
b. "X" x 2 + 1
c. "X" x 2 – 1
d. "X" + "Y"

x	y
1	3
2	5
7	15
10	21
15	31
n	

Student Resource 11B

5. Which function table best shows the relationship between "X" and "Y" for the following rule: 3x - 1

a

x	y
1	1
2	3
6	11
12	23
20	39

b.

x	y
1	4
2	7
7	22
10	31
15	46

c.

x	y
1	2
2	5
8	23
11	32
25	74

d.

x	y
1	0
2	3
5	12
12	33
16	45

6. Jhaved studied a function table and came up with the function 2x + 4. He then used the function table below to record the data. Finally he graphed the function in the graph below. Describe his mistake and how you would repair it.
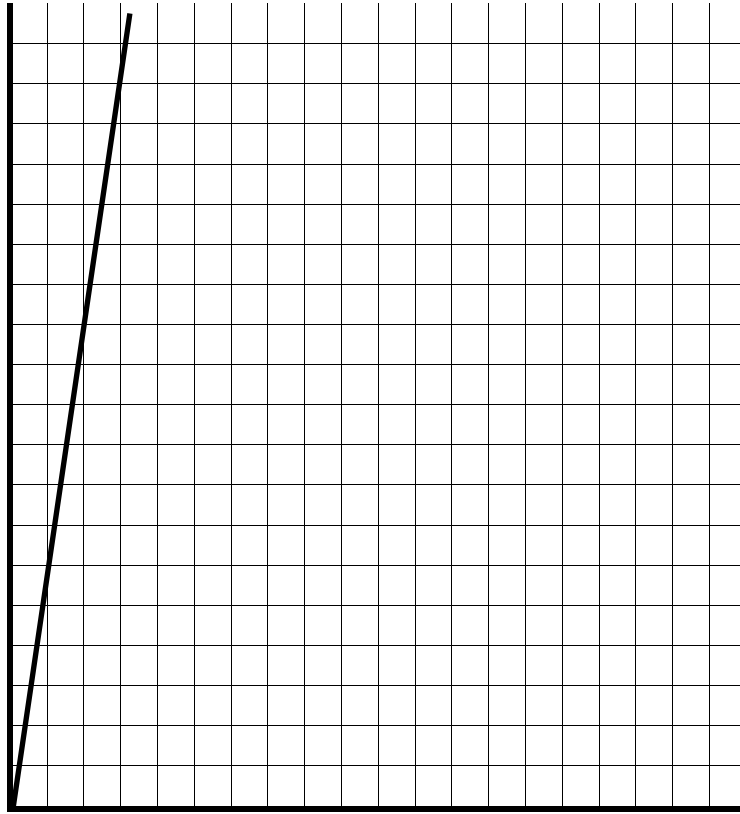
In	Out
1	6
2	8
5	14
3	10
7	18
2n + 4	y

_____
_____
_____
_____
_____

Directions: Below are some real-life scenarios that describe a relationship between two values. Read each scenario and fill in the function table to show the relationship.

1. An ice cream vendor sells scoops of ice cream everyday. For every scoop of ice cream he sells he charges $2.00. He uses one cup for every order of ice cream he sells. Each cup costs him $.50. He can fit as many scoops into a cup that he desires. Remember he uses just one cup per order but can have one or more scoops per order. What is the rule for how much profit he makes per scoop of ice cream sold

Rule: _____

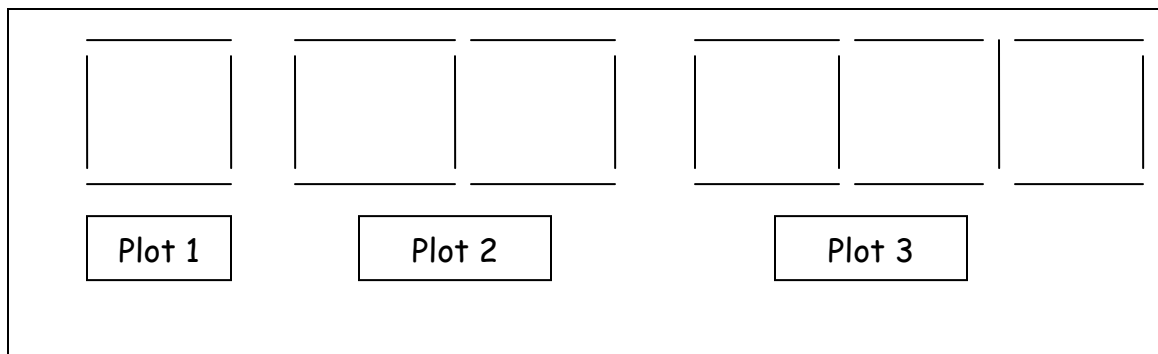| In (scoops)	Out (profit)
n (# of scoops)	

2. Studies show that for every hour of homework completed by a fifth grade student – he or she drinks 8 oz of soda. What is the rule to find how much soda a fifth grader would rink on any given school night. (helper – If a student completed one hour of homework they would drink _____ oz of soda. If they worked for two hours they would consume _____ oz of soda....etc.)

Rule: _____

In (HW hrs)	Out (oz of soda)
n	

On the Farm

Farmer Smith is the best farmer in Maryland, but he has encountered a problem on his rectangular crop farm. For each new crop Farmer Smith plants he needs to build a fence around the plot. The first plot Farmer Smith fences in uses 4 pieces of fence. Farmer Smith added a second plot to his crop farm and now has 7 pieces of fence around his rectangular crop garden. Take a look at Farmer Smith's crop farm and help him figure out how many pieces of fence he needs to go around 10 plots.

Use the toothpicks at you desks to create the following diagram. Complete the table to help you.

# of plots (x)	pieces of fence (y)
1	4
2	7
3	10
4	13
10	31

What is the rule for the pattern of pieces of fence (look at the "Y "column only) **increase by 3**

What's the rule (How do the numbers in the "X" column change into the numbers in the "Y" column)? **Multiply "X" column by 3 and add 1**

Create a function to prove your rule. **Y = 3x + 1**

On the graph below, graph the function table.
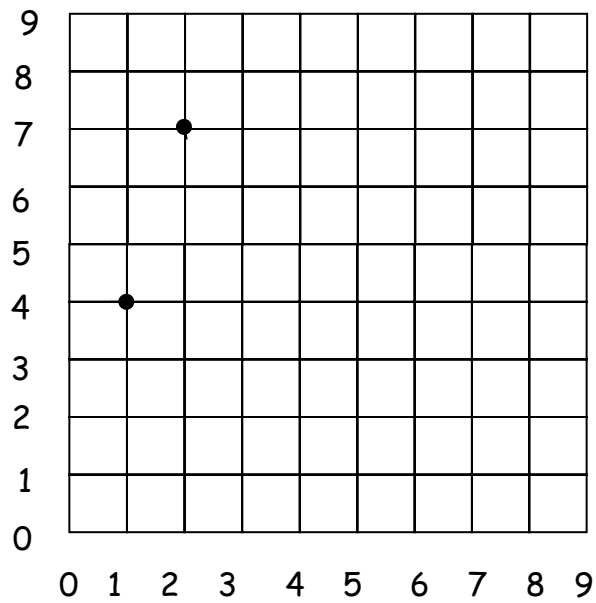
Fun with Triangles!

Directions: Below you see a pattern made up of triangles. Can you extend this pattern to make Triangle 4? Triangle 5? Use the triangles at your desk to create and extend the following pattern.

| Triangle 1 | Triangle 2 | Triangle 3 |
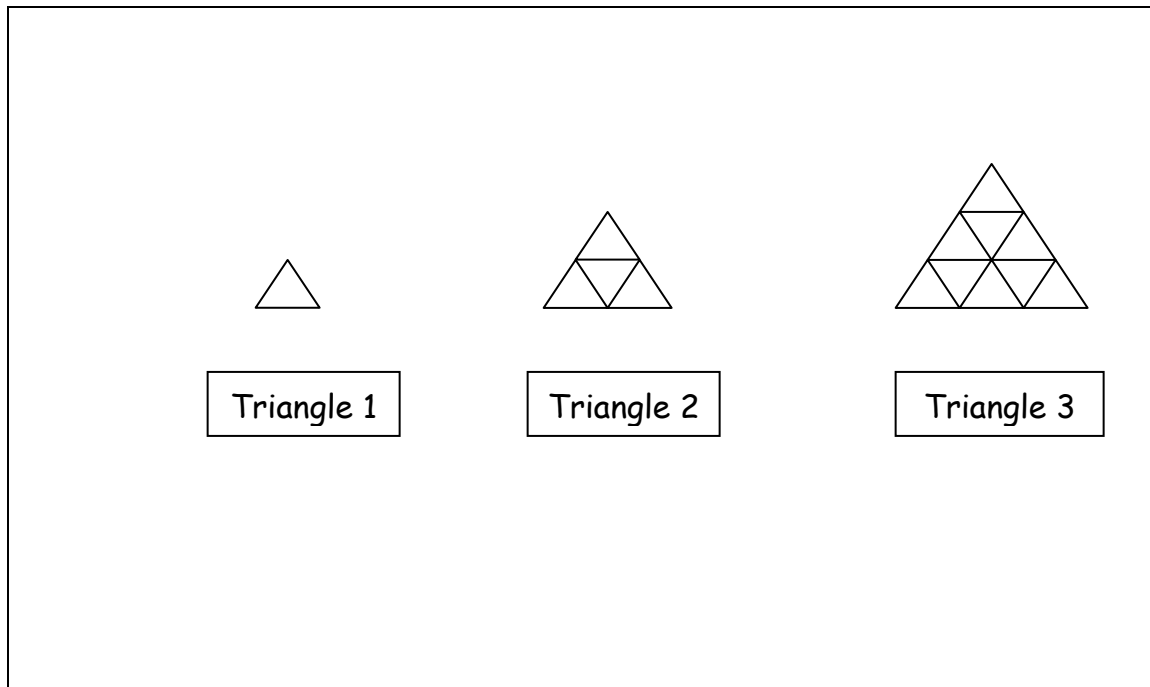
What pattern do you see in each additional triangle? How many triangles more does it take to build each new triangle?

The pattern I see is
Add 3, add 5, add 7, add 9, add 11…

Fun with Patterns and Function Tables!

Directions: Below you see patterns and function tables. Can you extend the patterns and identify the rules? Give it a try!

1.

(x)	(y)
1	4
2	9
3	14
4	19
5	24
6	29
7	**34**

What's my Rule? **5x - 1**

2.

(x)	(y)
1	3
2	7
3	11
4	15
5	**19**
6	**23**
7	**27**

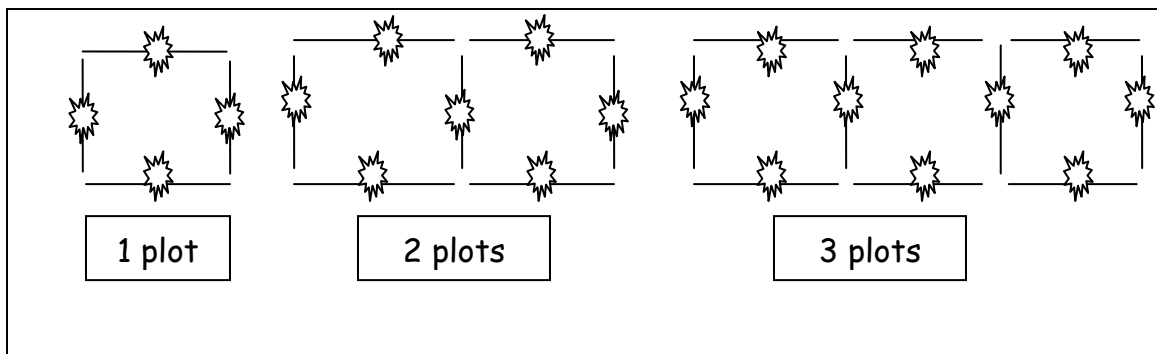What's my Rule? **4x - 1**

3. 3, 3, 6, 9, 15, **24, 39, 63, 102**   Pattern: add the number before
4. 4, 16, 64, **256, 1024, 4096, 16384**   Pattern: x4

On the Farm (Part 2)

Farmer Smith is the best farmer in Maryland, but he has encountered a problem on his rectangular crop farm. For each new crop Farmer Smith plants he needs to build a fence around the plot. The first plot Farmer Smith fences in uses 4 pieces of fence. Farmer Smith added a second plot to his crop farm and now has 7 pieces of fence around his rectangular crop garden. Take a look at Farmer Smith's crop farm and help him figure out how many pieces of fence he needs to go around 5 plots.

1 plot   2 plots   3 plots

Use the squares at you desks to create the following diagram. Use one square to create the first plot on your table. Use two squares to create the second plot and three squares to create the third plot. Use highlighter to highlight each side. **DO NOT TRACE A SIDE MORE THAN ONCE!** Use the squares and dry erase marker to help you. Once you have highlighted all of the sides as in the above picture, count the number of sides highlighted for each group of plots.

1 plot = ____4_____ pieces of fence

2 plots = ____7_____ pieces of fence

3 plots = ____10_____ pieces of fence

5 plots = _____16_____ pieces of fence

Working Out with Patterns

Exit Card

Fill in the next three terms in the following sequences.
5, 9, 13, 17, 21, 25, 29

What's the pattern? +4

1, 4, 9, 16, 25, 36, 49, 64

What's the pattern? Add 3, add 5, add 7, add 9….

Day 2 - Warm-up

Complete the sequences below.

2, 5, 10, 17, 26, 37, 50, 65

What's the pattern? Add 3, add 5, add 7, add 9, add 11, add 13….
Predict the 10th term in this sequence. 101

2, 5, 8, 11, 14, 17, 20

What's the pattern? +3
Predict the 20th term in this sequence. 59

1, 3, 5, 7, 9, 11, 13

What's the pattern? +2
Predict the 12th term in this sequence. 23

2, 6, 10, 14, 18, 22, 26, 30, 34

What's the pattern? +4
Predict the 15th term in this sequence. 58

What's the Function?

Directions: Below you see function tables. Can you identify the rule and write it as an expression? Give it a try!

1. Rule: 5x = y

# of coins (x)	amount of money (y)
1	5
2	10
3	15
4	20
5	25

2. Rule: 3x + 2 = y

# of plants (x)	# of buds (y)
1	5
2	8
3	11
4	14
5	17

3. Rule: 2x + 1 = y

# of garden (x)	# of crops (y)
1	3
2	5
3	7
4	9
5	11
10	21

4. Rule: 10x – 1 = y

# of trees (x)	# of birds nests (y)
1	9
2	19
3	29
4	39
5	49
10	99

5. Rule: x squared = y

# of orange trees (x)	# of oranges (y)
1	1
2	4
3	9
4	16
5	25
10	100

2. Rule: 3x = y

# of apple trees (x)	# of apples (y)
1	3
2	6
3	9
4	12
5	15
10	18

Teacher Resource 8A

Working Out with Functions!

Directions: Below are patterns. For each pattern you see create a function table using two different variables and create a rule. The first one is done for you.

in	out
1	2
2	5
3	10
4	17
5	26
10	101
n	N squared + 1

In	out
6	12
3	6
4	8
8	16
9	18
12	24
n	2n

In	out
4	13
2	7
5	16
6	19
7	22
10	31
n	3n +1

In	out
8	17
3	7
4	9
9	19
7	15
11	23
n	2n + 1

Graphs Just Won't Stop TALK – ing!

Directions: As a quick pre-assessment use the terms and labels from the word box to fill in the labels on the graph. Some items in the box you will not use. You may find a few new items in the word box. Can you place them accurately?

_Y__   _____Title_____

Label

(5,7)_____

___X_

_____Label_____

2n-3	
2	1
3	3
5	7
8	13
11	19

Word Box

Key   (5,7)   Divisor   X axis
Title   Label   Boundary
Graph   Y axis   Addend
Label

Just Potting Along
Creating a Slope From a Function

Directions: Using the function tables below: First, write the rule in the top table row. Next, write the missing function table values. Then correctly plot the coordinate points from the function table on the accompanying graph and draw the slope line. Use colored pencils: red for #1; blue for #2' yellow for #3.
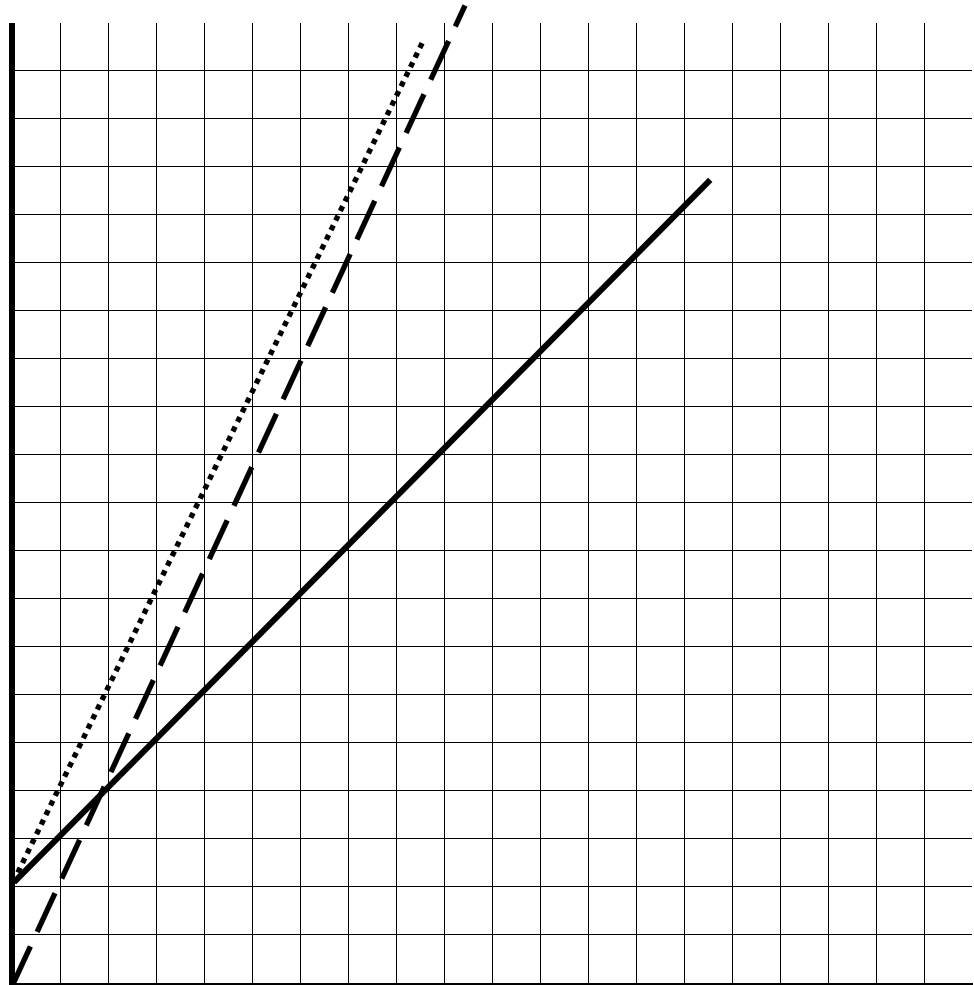
1

X + 2	
x	y
0	2
3	5
7	9
10	12
13	15

2

X x 2	
x	y
0	0
2	4
5	10
7	14
9	18

3

X x 2 + 2	
x	y
0	2
3	8
4	6
5	12
7	16

Putting Them All Together
Combining Patterns, Functions, and Slopes

Directions: Now that we have studied patterns, functions and slopes (graphing) you should be able to show your understanding of these math concepts. Read the following questions carefully and choose the best answer for the selected responses. For the written response remember to answer the question or prompt fully to show your understanding!

1. What are the next three values in the following pattern; 1, 3, 2, 4, 3, 5, 4, 6
   a. 7, 9, 11
   b. 5, 7, 9
   c. 5, 6, 8
   d. 5, 7, 6,

2. What do we call the expression that represents the relationship between two values?
   a. the pattern
   b. the rule
   c. the intersection
   d. the parallel

3. Choose the *rule* that fits the following function table:
   a. increase by 1
   b. increase times seven
   c. increase by seven
   d. increase to 35

x	y
1	7
2	14
3	21
4	28
5	35
n	

4. Which rule satisfies the function table?
   a. "X" + an odd number
   b. "X" x 2 + 1
   c. "X" x 2 – 1
   d. "X" + "Y"

x	y
1	3
2	5
7	15
10	21
15	31
n	

5. Which function table best shows the relationship between "X" and "Y" for the following rule: 3n – 1

a.	b.	c.	d.

.

x	y
1	1
2	3
6	11
12	23
20	39
n	

x	y
1	4
2	7
7	22
10	31
15	46
n	

x	y
1	2
2	5
8	23
11	32
25	74
n	

x	y
1	0
2	3
5	12
12	33
16	45
n	

6. Jhaved studied a function table and came up with the function 2x + 4. He then recorded the date in the function table. Finally he graphed the function in the graph below. Describe his mistake and how you would repair it.
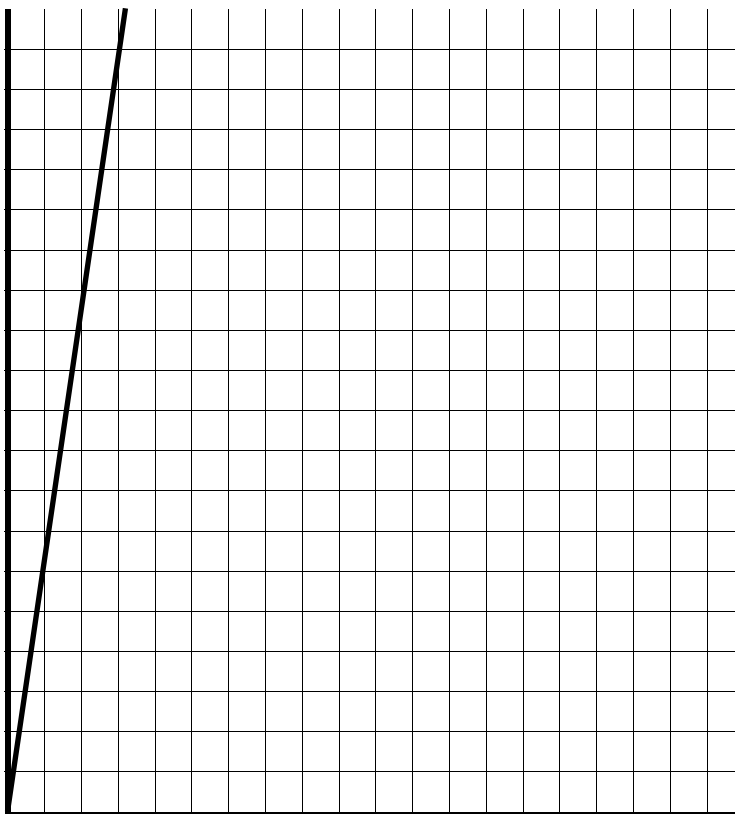
In	Out
1	6
2	8
5	14
3	10
7	18
2n + 4	y

Jhaved's mistake is that he started the plotting of the graph at (0,0). If he had used the function and substituted "0" for "X" he would have found that the correct coordinate plot for "0" is (0,4). He also did not check his other plots to make sure that he was drawing the correct slope.

Making it Real – Life, That Is
Life Applications That Lead to Number Relationships

Directions: Below are some real-life scenarios that describe a relationship between two values. Read each scenario and fill in the function table to show the relationship.

3. An ice cream vendor sells scoops of ice cream everyday. For every scoop of ice cream he sells he charges $2.00. He uses one cup for every order of ice cream he sells. Each cup costs him $.50. He can fit as many scoops into a cup that he desires. Remember he uses just one cup per order but can have one or more scoops per order. What is the rule for how much profit he makes per scoop of ice cream sold

Rule: _____n x $2.00 - $.50_____

In (scoops)	Out (profit)
1	$1.50
3	$5.50
5	$9.50
n (# of scoops)	n$2.00-$.50

4. Studies show that for every hour of homework completed by a fifth grade student – he or she drinks 8 oz of soda. What is the rule to find how much soda a fifth grader would rink on any given school night. (helper – If a student completed one hour of homework they would drink __1___ oz of soda. If they worked for two hours they would consume _16___ oz of soda….etc.)

Rule: ____n x 8 _____

In (HW hrs)	Out (oz of soda)
1	8
4	32
6	48
n	n x 8